The Use of a 3D-Printed Resorbable Graft Cage in the Treatment of Critical-Sized Segmental Bone Defects

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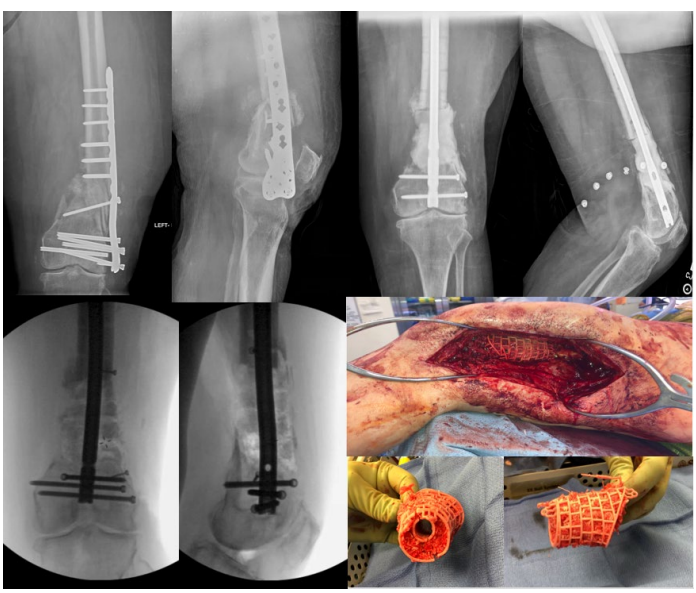
Purpose: Critical-sized segmental bone defects (CSSBDs) in the lower extremity (LE) are a challenging problem for numerus reasons. Several operative interventions have been well described in treating CSSBDs in the LE. The TRUMATCH Graft Cage (GC) is a 3-dimensionally (3D)-printed resorbable implant designed specifically to patient anatomy and bone defect size. The implant is designed to retain bone graft at the bony defect site while allowing the use of intramedullary nailing or plating for bony stabilization. The purpose of this study is to report a technical trick and early outcomes of 3D-printed resorbable GC in the treatment of CSSBDs of the LE.

Methods: Three patients with CSSBDs of the LE underwent staged induced membrane technique (IMT) with definitive bone grafting and 3D-printed graft cage at our academic Level I trauma center. We retrospectively collected data regarding patient demographics, comorbidities, complications, and follow-up.

Results: Two of the three patients had CSSBD of the distal femur and one had a CSSBD of the proximal one-third tibia. Two patients had infected nonunions of the distal femur after open plating at an outside hospital. The third patient developed osteomyelitis of the tibia after sustaining an open tibia fracture several decades previously. The average defect size was 9.33 cm (range, 7.5-12 cm). All three patients were treated with a staged IMT. First stage included extensive debridement, antibiotic cement spacer placement, and intravenous antibiotics. After clearance of infection (confirmed by laboratory values and clinical examination), all three patients underwent intramedullary nailing (two retrograde femoral nails and one suprapatellar tibial nail) and GC placement with autogenous bone. Average follow-up after GC placement was 16 weeks. All patients were fully weight bearing at last follow-up. One patient had exchange of distal interlocking screws at 6 weeks postoperatively due to screw prominence. There were no other early complications noted.



Conclusion: Early results of 3D-printed GC constructs appear promising as a treatment option for CSSBDs of the femur and tibia.

TECHNICAL TRICKS AND TIPS